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The Basics of a Utility Rate Study

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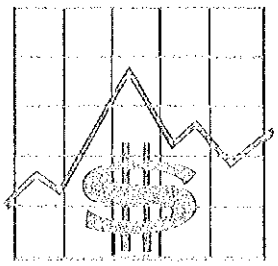


Utilities throughout Tennessee are confronted with ever-increasing operating costs, as well as the costs associated with testing and implementing procedures required to meet new state and federal regulations.

One of the most difficult decisions that elected officials must deal with is establishing equitable utility rates to ensure that sufficient revenues are being generated. State law mandates that any municipal utility must be self-sufficient. Revenues generated from utility sales, services, and other sources must meet all expenses, both operating and nonoperating.

The decision-makers know their community and their utility system. A utility's rate structure can be used to solve, or cause, many financial and political problems. Therefore, attention must be given to this all-important area. If the major criteria for developing a good rate structure – generating sufficient revenue, distributing the costs fairly across all user classes, and developing a structure easily understood by the customer – are included in setting the structure, the community will have solved many of its utility problems.

This publication will focus upon the elements involved in conducting a rate study, including:

- developing revenue trends and expense trends,
- gaining knowledge about future capital needs,
- gaining knowledge about changes in customers,
- projecting future years activity,
- reporting results,
- selling a rate or rate structure change,
- understanding the implication of the rate structure and equity issues, and
- assessing and improving the rate study data retrieval methods.

Rate structures, minimum bills, and tap fees will also be examined.

Acknowledgments

Joseph Muscatello, Jr.
Original Author, 1984

Why Perform a Rate Study?

A rate study is any financial review of a utility service that projects future revenues and expenses. Rate studies are done in various fashions and details. Usually, a city's first rate study is conducted after planning, but before completion, of a new and expensive public works project. Sometimes, a rate study can be accomplished with financial data alone - straight out of the annual audit. A more detailed rate study uses past customer consumption data to allocate costs by customer class.

But regardless of what method you use to review the system's finances, it should be a routine function of the utility to ensure that equitable rates are charged and sufficient revenues are produced. Ideally, a rate study should coincide with, and be an extension of, the yearly budget process. This encourages small, annual rate increases commensurate with inflationary pressures, which are much easier to implement than irregular, larger rate increases.

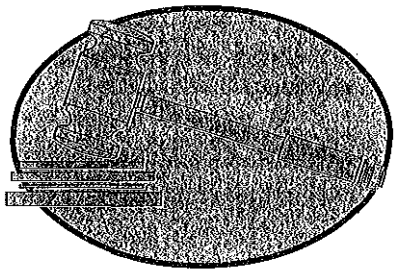
Spiraling Costs

All utilities are faced with increasing expenses. More stringent quality standards, higher sewerage effluent quality standards, fire-flow requirements, and general system upgrading continue to put upward pressure on the rate structure of your utility system.

Increasing maintenance expenses and maintaining the utility's infrastructure must also be considered. The infrastructure, such as sewer, water, and electrical lines, is the heart of long-term service delivery. Therefore, it must be maintained, repaired, and eventually replaced. These items are expensive, but are essential capital costs. Regular improvement to the utility's infrastructure helps to ensure a safe and healthy environment, as well as promotes economic growth for the community the utility serves.

And just as a successful business sells goods or provides services at a fee that is high enough to cover all its costs, the successful utility will charge fees and rates that are adequate to ensure continuing service. A rate study helps determine if the utility's rate structure provides ample revenue to operate the system in a safe and lawful manner.

Compliance With State Laws



T.C.A. 7-35-401a says: Every incorporated city and town in Tennessee is authorized and empowered to own, acquire, construct, extend, equip, and operate and maintain within and/or without the corporate limits of such city or town a water and/or sewerage service ... and to charge for such service.

The state of Tennessee mandates that any municipal utility must be a self-sufficient operation (*Tennessee Code Annotated* 7-34-115). Self-sufficiency is a simple concept that means revenues generated from utility sales, services, and other sources must meet **all** expenses, both operating and nonoperating, of the utility.

T.C.A. 7-35-401a grants municipalities the power to own and operate water and sewer systems and to charge a fee for operating the utility. There are other statutes enabling local governments to provide electric, gas, and solid waste services.

Check your charter, ordinances, or resolutions to see what authority was used to create your utilities. All Tennessee laws do not apply to all cities and utilities. Unless your utility was created under a certain statute, that section of *T.C.A.* may not apply. Still, most of the authorizing legislation is similar in regard to self-sufficiency.

For instance, the law requires that the rates charged must be sufficient to support the system. This includes operating and maintaining expenses, depreciation, and bond and interest charges (*T.C.A.* 7-34-114). A positive net income generally is evidence of sufficient rates to support the system.

Further, user charges shall reflect the actual cost of providing services rendered (*T.C.A.* 7-34-115). "However, no municipality shall operate the utility as a source of revenue to the municipality, but shall operate such utility for the use and benefit of the consumer served by the utility and for the promotion of the welfare and for the improvement of the health and safety of the inhabitants of the municipality" (*T.C.A.* 7-34-103).

The above code sections require a municipality that owns and operates a water or sewer utility to charge adequate rates to cover all expenses, but prohibits rate charges that would generate excess revenue that would allow the municipality to operate other governmental functions with revenue from the utility system.

However, unless your utility was created using *T.C.A.* 7-34-104, then the rest of 7-34 may not apply. *T.C.A.* 7-35 provides for water and sewer utilities. *T.C.A.* 7-39 authorizes the creation of municipal gas systems, and *T.C.A.* 7-52 authorizes the creation of municipal electric systems.

Note that rate differentials between inside and outside the city limits are not discussed. In fact, cities that operate utilities have broad discretion in setting rates and adopting rate structures.

Functions of the Rate and Rate Structure

The major function of a rate structure is to provide ample revenue to meet *all* expenses. In too many cases, municipal utility systems have implemented rate structures that are not generating sufficient revenue to meet the total cost of the system. This would produce a net loss that is in violation of state laws and usually in violation of any bond covenants derived from debt issuance.

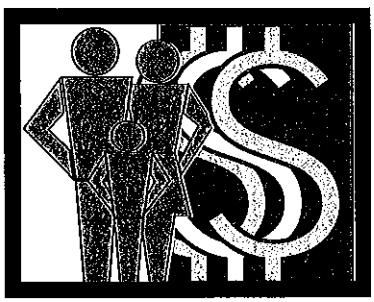
Another function of the rate structure is to proportionally distribute the approximate cost of the service to those benefited by the service. Unrealistic, low minimum charges are the failing of many rate structures. Often, those benefiting the most from the service are not paying in proportion to the benefit that they receive. An equitable structure must take into account all user classes, and the rates must be placed according to benefit and use.

The establishment of a good rate structure is of primary importance for the utility system. There are a number of factors that should be considered when developing or updating a rate structure.

A rate structure should:

- generate sufficient revenue to pay for the total cost of the system,
- distribute the costs of the system fairly across all user classes,
- enable the customer accounting to be easily performed, and
- be easily understood and accepted by the consumer.

Consider the criteria above before setting the final structure.



A very important, yet often overlooked, function is the understanding and acceptance of the rate structure by the consumer. The utility will receive more customer support if the consumer can readily realize that the rates are fair and equitable to all user classes. As a result, difficult financial decisions placed upon the policy-makers of the utility system will become much easier to implement if consumers understand the rate and rate structure.

Consideration should also be given to the rate structure and how it will affect the billing procedures. If a rate structure is put into place that will increase administrative costs significantly, then the structure should be revised. A complex rate structure within a small utility system will not only be more expensive to administer, but may also lead to confusion among the consumers. This could lead to less acceptance of other management policies.

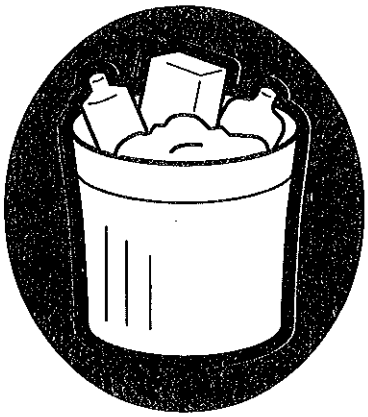
There are a number of other functions that may be built into a rate structure. Two other functions that bear mentioning are the conservation function and the lifeline rate function.

The rate structure can be set to provide for conservation of resources. This can be developed by increasing the rates substantially as the use of the product increases. We call this type of rate structure an "increasing block rate." Water conservation is important in many arid areas of the country. By charging more for each successive unit, higher consumption is discouraged.

Another function of the rate structure is its ability to provide a service to low-income consumers at a price below the actual cost of producing the commodity. This is referred to as a "lifeline rate" and will be further explained in a later section.

All of the above-mentioned functions should be considered when developing the rate structure. A conscious effort should be made to include these functions in the framework of the rate structure. Knowledge of the system and the consumers the utility serves is the main ingredient in developing a good rate structure.

Types of Rate Structures



There are a number of possible rate structures that may be considered, depending on the situation of the utility system. A few of the more common are: flat charges, uniform rates, declining block rates, and inverted or increasing block rates. Each has its advantages and disadvantages, and there is little agreement as to the most equitable rate structure. The following will offer a brief explanation of each and point out their strengths and weaknesses.

Flat Rate

A flat rate is used in utilities that do not meter usage but instead charge the same rate to all customers in the same user class. This is the simplest and most common rate structure for residential solid waste collection. Most cities have a fixed charge per week for residential pickup, whether there is anything to pickup. An advantage to the flat charge is that it is easy to project revenues, which makes budgeting easier.

This type of structure avoids the initial cost of purchasing and installing meters, and the periodic need to read meters for billing purposes.

Variations of a flat rate structure are used for publicly owned swimming pools and golf courses. Daily entrance to a swimming pool is a single charge, regardless of how many times the facility is used. Golf course green fees are the same for 18 holes, no matter how slow or fast you are.

The disadvantages to the flat rate structure are that it encourages waste, penalizes the small users, and may not be equitable for different types of users, such as commercial, residential, and industrial.

However, there may be a different rate for the type of user, and this can still be a flat rate structure. Garbage collection for a commercial customer is generally higher due to either a higher volume or more frequent pickups.

A typical flat rate structure would be all users paying $30 per month, regardless of their usage/consumption.

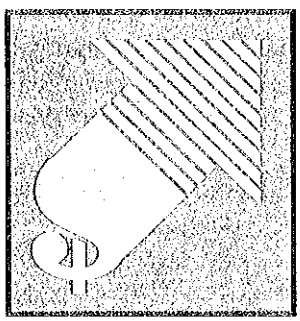
Uniform Metered Rates

Under a uniform rate structure, a constant price per unit is charged. This is most common for landfill tipping fees that charge by the unit (ton). This is also a common pricing strategy for wastewater systems, although volume is typically estimated based on water consumption via water meters. (Note that this wastewater rate structure may affect your current and potential water customers.)

Uniform rates are simple and easy to administer. However, a uniform rate does not recognize an economy of scale. Savings that may result from the processing of large quantities are not passed along to the consumer. But in return, charging uniform rates rather than a flat rate may encourage consumers to adopt conservation measures. As quantity increases, a customer's charge increases, even though the price per unit remains the same. The charge to the consumer is in direct proportion to the usage. There is no discount for high or low usage.

One drawback, especially in wastewater systems, is that additional costs for treating high-strength waste are not included. For landfills, the problem or cost is space. A charge per ton does not recognize additional costs associated with taking up more space. A ton of rock would not take up as much landfill space as a ton of styrofoam. Yet, the revenue would be the same. In these cases, a charge per cubic yard is more appropriate.

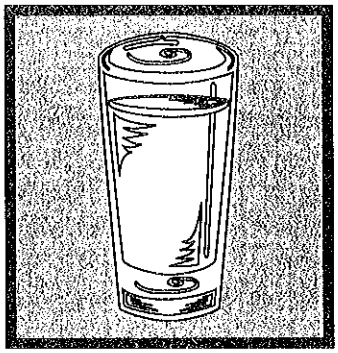
A typical uniform metered-rate structure would require the metering of consumption and every user paying a uniform rate per unit, such as water for $3 per thousand gallons.



Increasing Block-Step Rate

Under an increasing block rate structure, the price per unit increases. As consumption increases, the unit price increases with each successive consumption block. This approach is often used as a means to encourage water conservation and has been used in drought emergencies. Water consumption is typically measured in thousand gallons, although some utilities measure it by cubic feet.

It can also be argued that since higher water use is generally associated with higher income, the system is equitably based on the ability to pay. A drawback to this method is that larger users (industrial and commercial) may pay a disproportionate share. This may discourage industry from locating in the service area.



As consumption increases, the price per unit increases. As quantity increases, the cost to the consumer rises much sharper than with uniformed metered rates because the price per unit is going up. In addition to conservation, this is a very effective means of preserving limited capacity for treating water or wastewater.

A typical increasing block-step rate structure would require the metering of consumption and every user paying a uniform rate per unit, such as water for $3 per thousand gallons. However, the rate per unit would increase with higher volumes of consumption. For example, every 1,000 gallons after the first 10,000 gallons used is $4 per thousand.

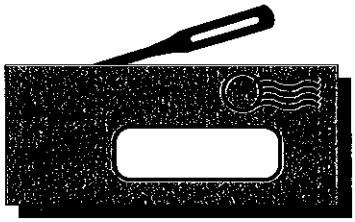
Decreasing Block

With the decreasing block rate, the price per unit decreases as consumption increases – the opposite of the increasing block-step rate. The unit price declines with each successive consumption block. As quantity increases, the consumer pays more, but at a declining rate.

This method is based on the concept of an economy of scale. This means that there are some costs that are fixed regardless of volume, such as debt payments. Above a certain systemwide volume, the debt payment is taken care of, resulting in a lower cost per unit. Among the metered systems, this is probably the most common method used for water utilities in Tennessee.

A typical decreasing block-step rate structure would require the metering of consumption and every user paying a uniform rate per unit, such as water for $3 per thousand gallons. However, the rate per unit would decrease with higher volumes of consumption. For example, every 1,000 gallons after the first 10,000 gallons used is $2 per thousand.

The problem with decreasing (and increasing) block rate structures is the subjectiveness. Who decides, and on what basis, whether the block rate should be changed?



Minimum Bills

The concept of minimum bills is to charge for the ability to serve. It is probably easiest to envision the need for a minimum bill when there is a seasonal usage. Consider a minimum bill for natural gas during the summer when natural gas is only used for heating, or a minimum water bill in a resort area during the off-season. The utility has year-round costs, such as debt payments and rent. Those costs do not fluctuate with usage or volume but are necessary in order to provide the customer with service on demand.

The minimum bill is typically charged every billing period and is the same for each customer class. A minimum bill is usually charged in addition to the block rate structures. There is no set formula for a minimum bill amount. However, all business managers would like to receive a guaranteed amount every month, at least sufficient enough to pay their debt service.

To calculate the minimum bill:

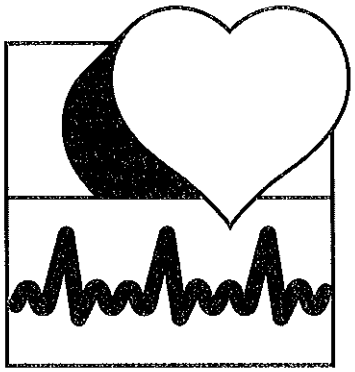
1. Determine how much revenue is desired for each billing period.

2. Determine your number of customers by class, in the event that they pay a different minimum bill for each customer class. It makes some sense to segregate customers by class, because it takes more infrastructure capacity and cost to provide service to a large industrial customer vs. a residential one.

3. Divide the desired revenue by the number of customers to arrive at the minimum bill per customer per class.

The minimum bill can generate a lot of revenue. It is not uncommon for wastewater utilities to get 20 percent of their revenues from the minimum bills. Remember that the minimum bill affects everyone, but obviously impacts the small-volume users the most. In most utilities, the small user is often the elderly or single household. These customers often subsist on a low and fixed income.

A block rate is usually coupled with a minimum charge for some quantity of water ranging from 1,500 to 3,000 gallons. Other water utilities have a minimum bill with no gallons included. It does not make any difference whether your utility's minimum bill includes any commodity. It is strictly a management decision.



Lifeline Rate

The lifeline rate represents an attempt to give a price break to the poor. It is usually manifested by a lower minimum bill than others within the same class. This is a social and political issue that came into vogue in the 1970s. However, looking at the big picture, if one customer gets a price break, someone else is paying for it. There may be a subsidy from the general fund, but most likely another customer is paying it.

Out-of-Town Customers

Should out-of-town customers pay more for utilities? That depends upon your situation. Most municipally owned water and wastewater systems increase the price of water beyond the city limits, and those rate differentials are consistently backed up by court decisions. However, electric and gas systems usually charge all customers within the same class the same rates.

Many cities that own water and sewer utilities financed the original plant as well as additions and improvements through general obligation bonds or general funds. Also, most revenue bond conveyances have the property tax mechanism for collateral in case of default (double-barreled bonds). Therefore, the city residents are responsible for the system and have either paid for the system in the past through general obligation bonds or have revenue bonds issued with the credit of the municipality. This is a good argument for higher outside rates.

Another argument for higher outside rates is that the outside customers place greater peak load on the system, thus, requiring larger transmission mains and pumping and storage capacity.

A third argument is that most municipally owned utilities pay no local property tax, whereas private utilities do (*T.C.A.* 7-34-115). In many cases, if an in lieu of tax is paid, it is far below what would be received if the utility was privately owned. The city customer of a city-owned utility must, through his property tax, make up the difference between the amount of tax the city would receive if the utility were privately owned and what the city receives from its water utility in lieu of taxes. If the city-owned utility makes no payment in lieu of taxes, the customer must pay the total amount.

A fourth point for higher outside rates is the cost of extensions for the pipeline and the maintenance of the system. Generally, the customer density is lower in more rural areas outside the city limits. The higher outside rate can be justified by the avoidance of spreading the cost of the extensions over the total system.

_T.C.A._ 7-34-115
"... payments to the municipality in lieu of ad valorem tax on the property of the public works within the corporate limits of the municipality are not to exceed the amount of taxes payable on privately owned property of similar nature."

Types of Fees

Exhibit A
Tap Fee Calculations

Wastewater		
Residential - 725	$2,000	$1,450,000
Commercial - 25	$4,000	$100,000
Water Plant		
Residential - 725	$1,000	$725,000
Commercial - 25	$2,000	$50,000

Tap Fees

There are many different fees and charges in utility operations. "Tap fee" is a very generic term with different meanings. A tap fee is generally a charge for accessing the utility. In some cases, a tap fee is designed to recover the costs of physically connecting to the utility system on a line in front of a residence. This is usually called a "connection fee" rather than a tap fee and may be very low.

In most utilities, a tap fee represents some type of buy-in to the system. In this case, the tap fee recovers some costs of the utility system beyond a connection charge. In wastewater systems, for instance, the tap fee may be designed to recover some of the costs of the entire collection and treatment system.

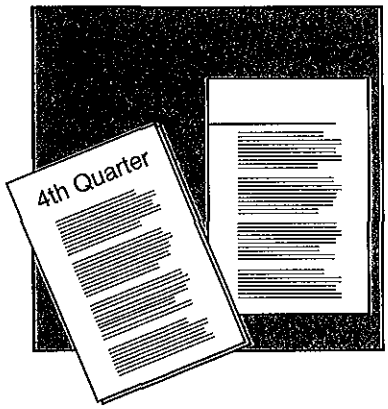
One way to gain acceptance for a higher tap fee is to compare the value of unimproved property to that of property improved with available utilities. Residential property improved with gas and water services will be worth several thousand dollars more than unimproved property. To the extent that a tap fee is less than the difference between unimproved and improved property, the utility is giving money away. A property owner or developer could sell his or her property the day after utilities are provided and realize a profit. When the tap fee is too low, the utility is, in effect, giving something away.

Reconnection Fee

Another common fee is the reconnection fee. This fee is generally a charge to reconnect a customer to the utility. For instance, a nonpaying customer is cut off or denied the utility service. Eventually, the customer will apply for service again after he or she pays the old bills. Someone from the utility will need to go out to the residence and reconnect the customer to the utility service. There should be some type of nuisance fee to avoid abuse and offset the costs of reconnection.

There really is no limit to the number of fees a utility may charge. Some utilities charge an accounting fee designed to offset the costs of setting up a customer in the computerized billing system. Utilities charge for other items as well. For example, new customers of electric and water services must pay for a meter. Generally, the utility wants customers to buy their meter from the utility. This eases reading, maintenance, and replacement problems when the utility provides one type or brand of meter.

The Rate Study



Gathering Historic Data

A rate study can be an intimidating task because there is so much work to do. But with computers and spreadsheet software, anyone can do a rate study. This can also be accomplished by using a columnar pad, but projections are more time-consuming.

Your best estimate of future revenues begins with what happened in the past. Every city is required to have an annual audit. Acquire the audits from the past three years, reviewing the revenues first.

For your spreadsheet layout, use the first column to describe the type of revenue described above. This should be the oldest data from three years ago. The second column should be two-year-old data. The third column should be last year, and the fourth column should be revenue data from the current year. *Exhibit B* on the following page shows the typical rate study layout.

Annualizing the Current Year

Typically, a rate study is performed sometime during the year with complete data from only a few months. The current year's data has not been audited. Be aware that mistakes are common. Some revenues and expenses are seasonal, so that any partial year reveals a skewed picture.

Your task is to project the partial data into a complete year. This is called "annualizing" the data. An easy way to start is to review each revenue and expense line item. Divide each line item by the number of months recorded so far and multiply by 12 months. This annualizes the data for a full year.

In addition, after completing a review of the previous three years, talk with your staff about apparent inconsistencies. A complete year should look a lot like the previous three years, unless there have been changes. Go back to your staff and ask the same questions about revenues and expenses for this year.

Remember that there should be a budget for the current year. And although utility budgets are notorious for being inexact, it should still be reviewed to help you complete this year's revenues and expenses.

Exhibit B
Rate Study

Small City, Tennessee
Water and Wastewater System

	3 Years Prior	2 Years Prior	Most Recent Audit Year	Current Year
Operating Revenues				
Wastewater Charges	$419,215	$427,770	$436,500	$437,000
Water Charges	$406,681	$414,981	$423,450	$424,000
Total Operating Revenues	$825,896	$842,751	$859,950	$861,000
Operating Expenses				
General & Administrative	$39,000	$43,000	$45,000	$46,000
Wastewater Expenses	$170,000	$189,000	$214,000	$215,000
Water Expenses	$130,000	$144,000	$150,000	$152,000
Wastewater Depreciation	$175,000	$175,000	$175,000	$175,000
Water Depreciation	$100,000	$100,000	$100,000	$100,000
Total Operating Expenses	$614,000	$651,000	$684,000	$688,000
Operating Income (Loss)	$211,896	$191,751	$175,950	$173,000
Nonoperating Revenue (Expense)				
Interest Income	$15,000	$2,000	$1,000	$500
Interest Expense	($240,000)	($231,940)	($233,558)	($214,841)
Total Nonoperating Revenue (Expense)	($225,000)	($229,940)	($222,558)	($214,341)
Net Income (Loss)	($13,104)	($38,189)	($46,608)	($41,341)
Add: Depreciation on Fixed Assets Acquired by Grants	$125,000	$125,000	$125,000	$125,000
Beg: Retained Earnings	0	$111,896	$198,707	$277,099
End: Retained Earnings	$111,896	$198,707	$277,099	$360,758

Stop and Review

Stop and review. Ask questions about anything that looks odd.

- Were there any rate increases during the last three years? Any decreases?
- Was there an unusual increase in the number of customers? Any decreases?
- Did you add a large commercial or industrial customer? Did you lose any big customers?

At this point, you are trying to get a feel for the type and amount of revenues your utility received. No one knows this better than staff, so ask questions whenever you are uncertain.

Do the same thing with expenses from the previous three years.

- Were there any large expense increases during the last three years? Any decreases? (Look into each expense category rather than total expenses.)
- Did you create any new positions? Any layoffs?
- Were there any new, expensive regulations to comply with during the previous three years?
- Were there any construction projects during the last three years?
- Did you purchase any new capital equipment during the last three years?

At this point, you are trying to get a feel for the type and amount of expenses your utility incurred.

Note that it is not unusual for a utility's revenues and expenses to fluctuate with the demand for services. For instance, in cold weather energy sales and revenues will increase, and the cost of purchasing that energy (gas, electricity) will also increase. In dry weather, water sales should go up, and the cost of treatment should go up. These are normal relationships between revenues and expenses.

Developing Trends

Now that you have a complete picture of revenues and expenses through this year, let's talk about the future.

You should have four years of data for each line item. Normally, most everything will increase. Revenues from sales increase as new customers are added. Expenses have probably increased over the last four years and will probably increase in the future with inflation. These are called trends - every utility has them. Generally, you can use these trends to project revenues and expenses into the future.

Remember those questions you asked your staff? You were acquiring trend information apart from all the unusual and nonrecurring items, such as adding a large commercial customer. Unless you add a new and large commercial customer every year, which would be your revenue trend, you would want to factor out that large customer from your revenue-growth trend. Otherwise, you will project adding a new commercial customer's revenue every year in the future.

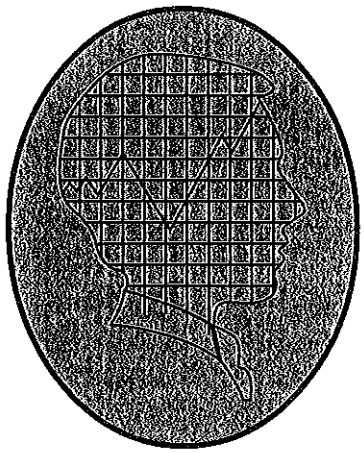
Every revenue and expense line item has a trend. These trends allow you to make an educated guess as to what will happen next year and successive years. So, go ahead and project next year's revenues and expenses. Review them for reasonableness. Do you really believe revenues will perform as you projected? What about expenses? Since you know that there is a relationship between revenues and expenses, do your projections make sense when reviewed in total?

When trends are unknown, use an inflationary factor to increase expenses. The Consumer Price Index (CPI) is widely available and tracks the increase in prices of certain items. It is even broken down by regions of the country. You can develop a CPI trend of the last few years and increase your expenses by this amount.

Note that revenues will generally not grow as fast as expenses. Revenue increases are a function of growth, fluctuations in usage, and price increases. The CPI is not an acceptable predictor of revenue growth. If you are not adding customers, revenue increases from growth would be zero. In some smaller towns with dwindling job opportunities, growth is negative as people continue to leave. Older, established utilities may not have any growth. New systems may experience substantial growth. It's tough to generalize, but a 1 to 2 percent revenue growth rate is pretty good. *Exhibit C* on the following page shows the projections of the comprehensive example.

Exhibit C
Rate Study

	Project Year 2	Project Year 3	Project Year 4	Project Year 5	Project Year 6
Operating Revenues					
Wastewater Charges	$441,000	$445,000	$449,000	$453,000	$458,000
Water Charges	$428,000	$432,000	$436,000	$440,000	$444,000
Wastewater Rate Increase	$54,000	$54,000	$54,000	$54,000	$54,000
Total Operating Revenues	$923,000	$931,000	$939,000	$947,000	$956,000
Operating Expenses					
General & Administrative	$47,840	$49,754	$51,744	$53,813	$55,986
Wastewater Expenses	$223,600	$232,544	$241,846	$251,520	$261,580
Water Expenses	$158,000	$164,403	$170,979	$177,819	$184,931
Wastewater Depreciation	$175,000	$175,000	$175,000	$175,000	$175,000
Water Depreciation	$100,000	$100,000	$100,000	$100,000	$100,000
Total Operating Expenses	$704,520	$721,701	$739,569	$758,152	$777,478
Operating Income (Loss)	$218,480	$209,299	$199,431	$188,848	$178,522
Nonoperating Revenue (Expenses)					
Interest Income	$2,000	$2,000	$2,200	$2,300	$2,200
Interest Expense	($205,775)	($196,347)	($186,540)	($176,343)	($165,737)
Total Nonoperating Revenue (Expenses)	($203,775)	($194,147)	($184,340)	($174,043)	($163,537)
Net Income (Loss)	$14,705	$15,152	$15,091	$14,805	$14,985
ADD:					
Depreciation on Fixed Assets Acquired by Grants	$125,000	$125,000	$125,000	$125,000	$125,000
BEG: Retained Earnings	$360,758	$500,463	$640,615	$780,706	$920,512
END: Retained Earnings	$500,463	$640,615	$780,706	$920,512	$1,060,497



Gaining Knowledge About the Future

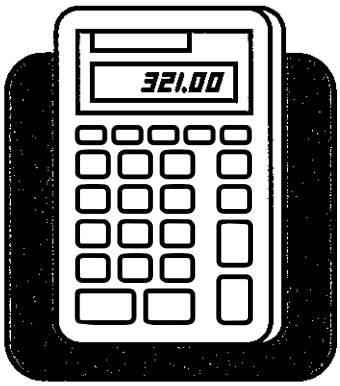
Now, there are new questions to ask your staff. Someone knows if there will be a new subdivision built. Someone knows if utility lines will have to be moved. Someone knows the percentage of raises that will be given to employees next year. Believe me, someone is anticipating and planning the future for your community. Maybe it's the development district or the chamber of commerce. In a larger city, it may be the budget office. Talk to prominent developers. Acquire their knowledge. Ask what will happen next year. It is easier to ask questions about the near future than about long-range planning. Later, of course, we will want to know about successive years.

There are items unrelated to trends that must be discovered before any rate study is released. Don't forget to talk to the utility manager about the capability to serve any anticipated growth. Specifically, ask about plant capacity for water and wastewater systems. Is the infrastructure adequate or in place to accommodate growth or certain types of new customers? You need to find out what it will cost to serve any new customers. Will new lines or pump stations need to be constructed? What about capital repairs or expensive, irregular maintenance that has not shown up in your expense trends, such as painting water storage tanks?

Also, how will these items be purchased? Will the utility issue notes or bonds? If so, interest expense will increase as will principal repayments.

One thing that makes this easier is the long-term nature of utilities. It really does not matter what year these improvements occur, as long as you have included them sometime within your rate study time frame. In most cases, the impact on rates is minimal.

Cost of Service Study



A cost-of-service study or financial rate study looks only at revenues and expenses. Although it can be detailed, it really is not much different from dividing the net loss by sales to determine the percent of rate increase necessary to break even. You can tell how much revenue is generated by customer class, but little else. Still, for most utilities, the cost of service rate study is adequate unless you believe there is some inequity between user classes or in the rate structure.

In most utilities, there is a lot of statistical data available concerning customer usage that we have not discussed. By utilizing customer consumption data, we can say something about the equity of rates and the rate structure. In fact, when you know customer usage, you can determine if the rates are equitable.

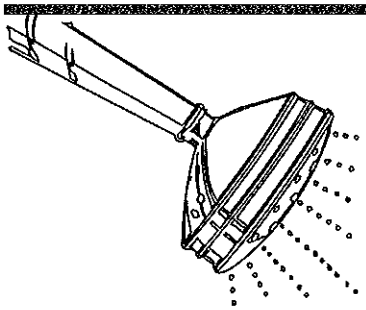
Therefore, a cost-of-service rate study begins with analyzing the customers' usage or consumption data. The classic cost-of-service study can be illustrated with a water utility example where consumption is metered. When meters are used, we know two things. First, we know how many gallons of water are treated and pumped, because there is a master meter at the water treatment plant. (This is usually reported in thousands of gallons.) Second, we know how much water is consumed by each customer because someone reads each water meter. Water meters are usually read each month for billing purposes. Today, most utilities input the water readings into a computerized billing system. So, you should be able to determine everyone's monthly usage very easily.

Usage Ranges

Most utilities can generate a monthly report that shows their total customer consumption by usage range. This report is usually produced by customer class (residential, commercial, industrial). Usage range is something that may be predetermined, but it is usually tailored to the rate structure and can be changed. This report would start with the minimum bill and show everything known about the minimum-bill customer in different columns.

You should have a column for:

- the number of minimum-bill customers,
- the gallons used or metered (if your minimum bill includes any water, which is normally 2,000 gallons), and
- the dollar amount of revenue generated from all of the minimum-bill customers.



The next row would be for the next usage range - those using between 2,000 and 3,000 gallons (the amount included in the minimum bill). The next range would be all customers using between 3,000 and 4,000 gallons, and so on. When finished, this monthly report lists all customers and their consumption by their usage range.

Generally speaking, the more detailed the study the better, depending on your utility's customer mix. The cost-of-service study tries to model your utility's consumption and revenue for the entire year. When the model is completed, you should be able to say that last year (or the year from which the data is pulled), we had X number of minimum-bill customers that used X thousands of gallons and generated X dollars. Ideally, you would like to know this data for every usage range. Then you can check your model against last year's actual results. You know how many gallons were produced by the water plant, how many gallons were billed to customers, and how much money was generated from these sales. If your model has every usage range, then your numbers should equal last year's actual results. *Exhibit D* shows how a cost-of-service study tries to model your utility's consumption and revenue for the entire year.

From a practical standpoint, some collapsing of usage range, especially in the larger ranges, is necessary. This can be tailored to your utility. By including every usage range from zero to 15,000 gallons, the study includes practically every residential customer and many small businesses. Next, start collapsing ranges such as 15,000 to 20,000; 20,000 to 25,000; 25,000 to 35,000; and so on. You should end with the actual consumption of the 10 largest users.

Although there is no certainty that customers will continue to use their current volume in the future, a model that mirrors what happened last year can make projections into the future. The consumption data allows you to determine equity in the rates and rate structure.

To determine how much revenue is produced by the residential minimum-bill customers:

1. Divide this amount by the total revenues to determine the percent of revenue received from minimum-bill customers. In small towns, this could easily be 25 percent.

2. Look at their usage and divide the thousands of gallons used by residential minimum-bill customers by the total number of gallons consumed.

3. Next, compare the percentage of usage to the percentage of revenue generated. If it is less than 25 percent, then there is an equity question.

You can do this for any usage range. It is useful to compare this by the ranges of your rate structure. This is easy to do if you began this cost-of-service study by collapsing ranges according to the rate structure. You may decide to raise or lower certain rates or change your rate structure to arrive at a more equitable arrangement.

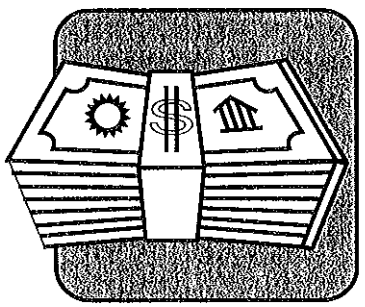
Another comparison is by customer class. How many gallons and dollars are generated by the commercial customers relative to total consumption and total revenue? If the usage percentage is not equal to the revenue-generated percentage, an inequity is possible. When there is a declining block rate structure, you almost always find that the smaller users (residential customers) are subsidizing the larger commercial customers. However, refer back to the rate structure section on economies of scale before attacking any apparent inequities.

Exhibit D
Customer Revenue Calculation by Usage Ranges

Customer	Total Monthly Usage	Usage 0 to 2,000 @ $5 per	Usage 2 to 12,000 @ $5 per	Usage over 12,000 @ $5 per
Wastewater Usage				
725 Residential	3,625	1,450	2,175	0
25 Commercial	1,250	50	250	950
Water Usage				
725 Residential	3,625	1,450	2,175	0
25 Commercial	1,250	50	250	950
	Monthly Minimums	**Usage 0 to 2,000**	**Usage 2 to 12,000**	**Usage over 12,000**
Wastewater Dollars				
725 Residential	$10,875	$7,250	$10,875	$ 0
25 Commercial	$1,125	$250	$1,250	$4,750
Water Dollars				
725 Residential	$10,875	$7,250	$9,788	$ 0
25 Commercial	$1,125	$250	$1,125	$3,800
	Monthly Revenues	**Annual Revenues**		
Wastewater				
Residential	$29,000	$348,000		
Commercial	$7,375	$88,500		
Water				
Residential	$27,913	$334,950		
Commercial	$6,300	$ 75,600		

* All calculations based on thousands of gallons.

Enterprise Fund vs. General Fund Accounting



In Tennessee, traditional utilities such as wastewater services are almost always accounted for in an enterprise fund separate from the general fund. An enterprise fund is one that is operated and accounted for in a manner similar to businesses. That is, the cost of providing services to the general public is financed through user fees.

One of the obvious differences in general versus enterprise fund accounting is in the balance sheet. The balance sheet is an accounting report that shows what the entity owns and owes. For the general fund, the only items reflected in the balance sheet are assets and liabilities for the current budget year. Current assets are items that become cash during the budget year, such as investments. Current liabilities are items that use funds during the budget year, such as accounts payable. The difference between current assets and current liabilities is fund balance. Fund balance represents the amount of cash available for spending.

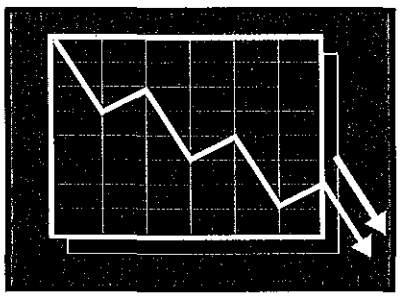
With enterprise funds, all current and long-term items are shown in its balance sheet. The concept here is that a utility must have specific equipment to deliver its specific services. Certainly, the general fund has long-term assets, such as buildings or fire trucks. But for accounting purposes, they are listed in something called an "account group" rather than in the general fund balance sheet.

Long-Term Assets

Long-term assets are things of value, or more aptly, things with future value beyond the budget year. Wastewater treatment plants, water meters, electric transformers, gas transmission lines, and landfill leachate collection systems are all examples of assets with long lives (long-term assets). With enterprise fund accounting, we recognize that these long-term assets are necessary and are required to provide future utility service.

Sometimes, things with future value are not capitalized into long-term assets even though they meet the criteria. Instead, they are expensed when they are purchased. When you expense an item, it reduces net income that year. The concept behind depreciation is to spread the purchase cost over several years. Inexpensive items such as small hand tools may last 10 years, but the impact of expensing these items is slight and not material. It takes time and labor to capitalize and then track an item. It simply is not worth the effort to capitalize inexpensive items. Your auditor can help establish a dollar threshold where items will routinely become capitalized. Anything above that dollar threshold should be expensed.

In effect, assets "earn" money (revenue) over their respective future years (lives). Consider that it takes the entire wastewater treatment plant to treat one gallon of influent and produce one gallon of safe effluent. Further accept that the plant will last 40 years before needing major renovation. That means that a little portion of every pump, pipe, and architect's fee goes into treating every gallon over the next 40 years. We recognize this through depreciation expense.



Depreciation Expense

Depreciation is an accounting theory. The concept is used to record an expense for the costs of long-term assets as they are used. Remember that these assets are used exclusively to provide the utility service. Depreciation is an approximation calculated by dividing the historical cost of the asset by its estimated useful life. Annual depreciation is considered an operating expense and should be funded like any other operating expense.

Most government utilities use a straight-line method to calculate depreciation, whereby an equal amount is expensed every year of an asset's useful life. Using this method, a piece of equipment costing $25,000 with an estimated useful life of five years would have depreciation expense of $5,000 per year.

There are several other methods of computing depreciation. Most of those methods charge more depreciation in the early years in order to get the tax write-off. Regardless of the method of computing depreciation, the end result is the same.

Obviously, the straight-line method of computing depreciation expense is an approximation. Your local government should maintain its equipment to ensure the maximum possible useful life. Different assets will have different life expectancies and are depreciated over various time frames. Pumps may last 10 years, while collection lines may last 50 years.

However, increased usage and lack of maintenance can greatly reduce the useful life of a truck or any asset. Certainly, the first year of a truck's life is better than its last year, and the value goes down quickly. There are several ways to calculate depreciation expense. The first step is to contact your auditor and review your depreciation schedules.

Depreciation aside, in reality, long-term assets wear out over time and with usage and eventually need replacement. A communication problem facing managers involves the long-term nature of their utility assets coupled with the high cost of today's replacement technology. It is hard to imagine, for instance, that a wastewater treatment plant serving 750 customers could cost $7 million dollars. Often, the acquisition is subsidized with grants that reduce the local cost. Depreciation is based on the value of the asset, including grants, loans, donations, and cash. *Exhibit E s*hows the depreciation calculation. With a composite life of 40 years, the annual depreciation on $7 million is $175,000 per year. For a $4 million plant, annual depreciation is $100,000.

Exhibit E
Depreciation
Calculations

	Cost	Useful Life	Annual Depreciation
Wastewater Plant	$7 million	40 years	$175,000
Water Plant	$4 million	40 years	$100,000

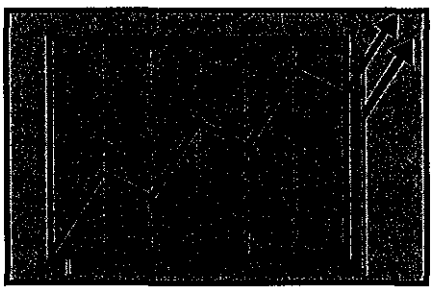
Regardless of how it was acquired, the treatment plant is wearing out. Even if the system lasted 40 years, the depreciation expense would amount to $20.80 for each customer each month. (That's $5 million divided by 40 years, divided by 500 customers, then divided by 12 months.)

The straight-line depreciation expense for this wastewater system is $125,000 per year - year in, year out - for the next 40 years. In 40 years this plant will be worn out and incapable of operating. Yet, it will no longer cost $5 million to replace this plant. It will cost millions more. This is the shortcoming of depreciation. It is based on the original costs, rather than replacement costs.

Therefore, if you are not collecting money for depreciation, you are passing those costs onto the next generation of users. This is the crux of many utility billing disputes. Some managers, especially in those cities that were highly grant-funded, do not agree with recognizing depreciation expense. There is often a general feeling that grant dollars will be available again (a strong legacy of the Clean Water Act and other grant programs). Customers and elected officials want the lowest possible utility bills *now*. They would prefer that future customers borrow money when asset replacement is required rather than save money now.

Another problem for most small cities is the value of their utility assets compared to their general fund. In our wastewater system example on Page 22, in eight years it will cost $1 million in depreciation expenses. If collected, this money could be invested. And with $1 million to $3 million invested, it is hard to imagine raising utility rates. And yet, this utility needs to recover $5 million over the 40-year useful life of the infrastructure.

Because of state laws and good business concepts, we now expect utility rates to be set high enough to recover all costs, including depreciation. Acknowledge the high cost of depreciation and explore ways to calculate it based on your government's usage and experience. Eventually, assets wear out over time and need replacing.

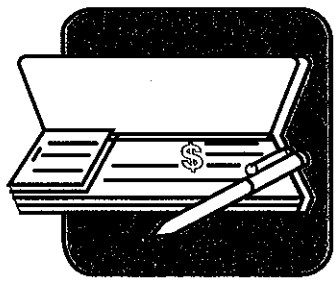


NetIncomeandRetainedEarnings

A common question asked by local governments is,"where does the money go that is generated through depreciation expenses?" The answer will depend on whether or not depreciation dollars are set aside and invested, which is rare. But from an accounting viewpoint, there is no restriction on how a utility spends its money as long as it pays for some legal-fund purpose.

The next question most often asked is about retained earnings. People try to equate them to fund balance, which they aren't. Retained earnings are simply all of the net incomes less all of the net losses that your utility has had since its inception.

So, where does the money go? Most of the time, it is spent on debt principal repayments and acquiring new assets. Neither of these items are reflected in the income statement. Therefore, they are not part of any net income or loss. Thus, depreciation expenses may help the utility extend sewer lines and purchase less expensive capital assets without incurring new debt.



Debt Principal Repayment

One difference between enterprise and general fund accounting is debt repayment. The general fund always shows principal repayment on debt as an expenditure on the annual statement of revenues and expenditures (the general fund operating statement). However, the balance owed on any long-term debt is never shown in the general fund balance sheet. It is shown in a separate long-term debt account group.

An enterprise fund never shows principal repayment on debt on its income statement or operating statement that reflects revenues and expenses. Not all expenditures are expenses, and not all expenses are expenditures. Depreciation is an expense, not an expenditure. Principal repayment is an expenditure, not an expense. Interest payments are both an expense and an expenditure. The difference is due to the fact that an enterprise fund has current and long-term items in its balance sheet.So, when a debt repayment is recorded in an enterprise fund, it is merely a reduction of a long-term liability. Everything is together with an enterprise fund.

The general fund only has current assets and liabilities in its balance sheet. Its annual operating statement records expenditures and revenues. When an annual budget is balanced with a definite revenue source such as taxes, expenditures and revenues are the important aspects to the elected officials. Remember that the purpose of the general fund is to account only for the budget year. The budget is very important to the general fund because a tax rate must be set in order to pay for the annual costs of operating a city.

Enterprise fund revenues come from ratepayers. The enterprise fund's budget is just a guide, rather than a legal spending limit. *Exhibit F* shows the debt principal and interest. In the last audit year, wastewater principal repayment on a $2 million loan was $72,644. The annual principal repayment on a $4 million water loan was $145,288.

Exhibit F
Debt
Calculations

* State Revolving Fund

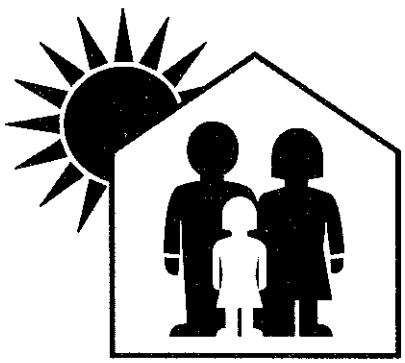
		SRF* Loans 4%	Interest	Principal	Total
Year 1	Wastewater	$2,000,000	$80,000	$67,164	$147,164
	Water	$4,000,000	$160,000	$134,327	$294,327
Year 2	Wastewater		$77,313	$69,850	$147,163
	Water		$154,627	$139,700	$294,327
Year 3	Wastewater		$74,519	$72,644	$147,163
	Water		$149,039	$145,288	$294,327

Analyzing and Reporting Results

After the rate study, or cost-of-service study, is complete, the results must be analyzed and reported. The first part of analyzing includes an overall review. Does the rate study make sense to you? Are revenues from growth really going to occur? Are expense increases adequate? Do you feel comfortable with the accuracy to present these results to the governing body?

Now is the time to share the completed report with staff. Encourage them to shoot holes in the report. Allow them time to review. Be prepared to discuss and defend your trend analyses. Make sure that they agree with any planned changes that you got from staff in the first place. The staff must agree with the results and become comfortable with the projections before you should submit anything to the governing body.

Selling a Rate or Rate Structure Change

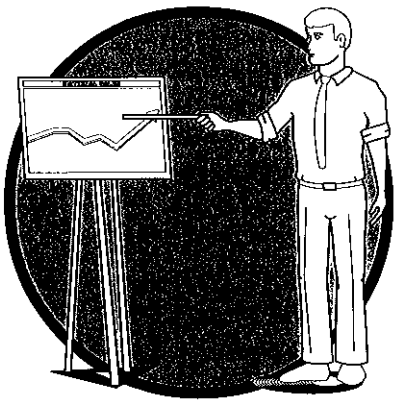


Nobody likes to raise utility rates - especially elected officials. It is always an uphill battle. On the other hand, everyone knows that prices go up over time. Cokes are no longer a nickel, gas is not 20 cents per gallon, and movies cost a lot more than they did 10 years ago. Still, not many people kick about those prices. The key is perceived value.

The good news about all the increased regulations and testing requirements is the resulting high-quality product. Even our wastewater is cleaner than our drinking water was in the past. The value is there, but the general public may not know it. Don't assume they do.

The first step in selling a rate increase is to inform the staff members of the utility. Honesty is the byword. If you can't convince them of the quality of the product and the need to raise rates in order to maintain or improve that product, then don't bother going to the governing body.

Seriously, a rate increase should only occur when necessary. It's management's job to recommend it, and the governing body's job to pass it. But, it's the consumer who must accept it. Everyone working in the utility is a potential "maker or breaker" of a proposed rate increase. Employees talk and people talk to them. Make their public relations job easier by making sure they know the facts. Stop the speculation and rumors. Put things in writing. Discuss it during staff meetings. Answer their questions sincerely and honestly. Also, this is good preparation for the public meetings.



The next step is to inform the governing body about the results of the rate study. This is best done in a work session. Have the proper staff in attendance, and make sure that they are ready to answer questions. Management should make the presentation. Take your time, and be honest and informative.

The elected officials have the toughest job in this process. They have other responsibilities that command their attention. They have constituents who demand low rates and low taxes. Still, officials are elected to make decisions, and it is in the utility's best interest that rates be increased to continue operating as planned. Management must be prepared to give the elected officials all the data they need to say "yes." Even with a good, informative presentation, they know less about the rate study than management.

The elected officials and the utility staff should inform the public. Formally, this is called a public relations campaign. Besides honesty in presenting information and reminding the public of product quality, the most important feature of a successful campaign is planning. Generally speaking, people don't like change, so plan ahead in order to give the customers time to get used to the need for a rate increase. You should allow a minimum of six months between the time the public first hears about a rate increase and the date of implementation. Again, remember the long-term nature of utility services. Don't allow your utility to get into a financial position where an immediate rate increase is required. With an on-going PR campaign, people will anticipate and even expect a rate increase. A monthly flier included in the utility bill or a quarterly newsletter are two good methods for keeping the public informed.

Conclusion

One thing certain about a rate study is the need for another one in the future. Not every rate study means a rate increase. Trends and assumptions change every year. An annual rate study that projects five or 10 years into the future is a great planning document.

Only you can determine what is right for your utility. Local governments generally have a lot of latitude in setting rates and rate structures. Some utilities raise rates annually to compensate for inflation and to minimize the shock to ratepayers. Others believe that any rate increase is undesirable. They would prefer a large increase every few years over a smaller, annual increase.

Each system is unique and faces constraints that it must deal with individually. The rate structure should be designed to meet the financial, environmental, and organizational needs of the community it serves.

If the major criteria for developing a good rate structure are included in setting the structure, the community will have solved many of its utility problems. A good rate structure should:

- generate sufficient revenue,
- distribute the costs fairly across all user classes, and
- be easily understood by the customer.

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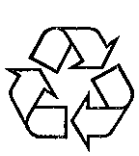

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